E-Soar Plus for Taranis & Horus

Version 2.1

Setup Guide

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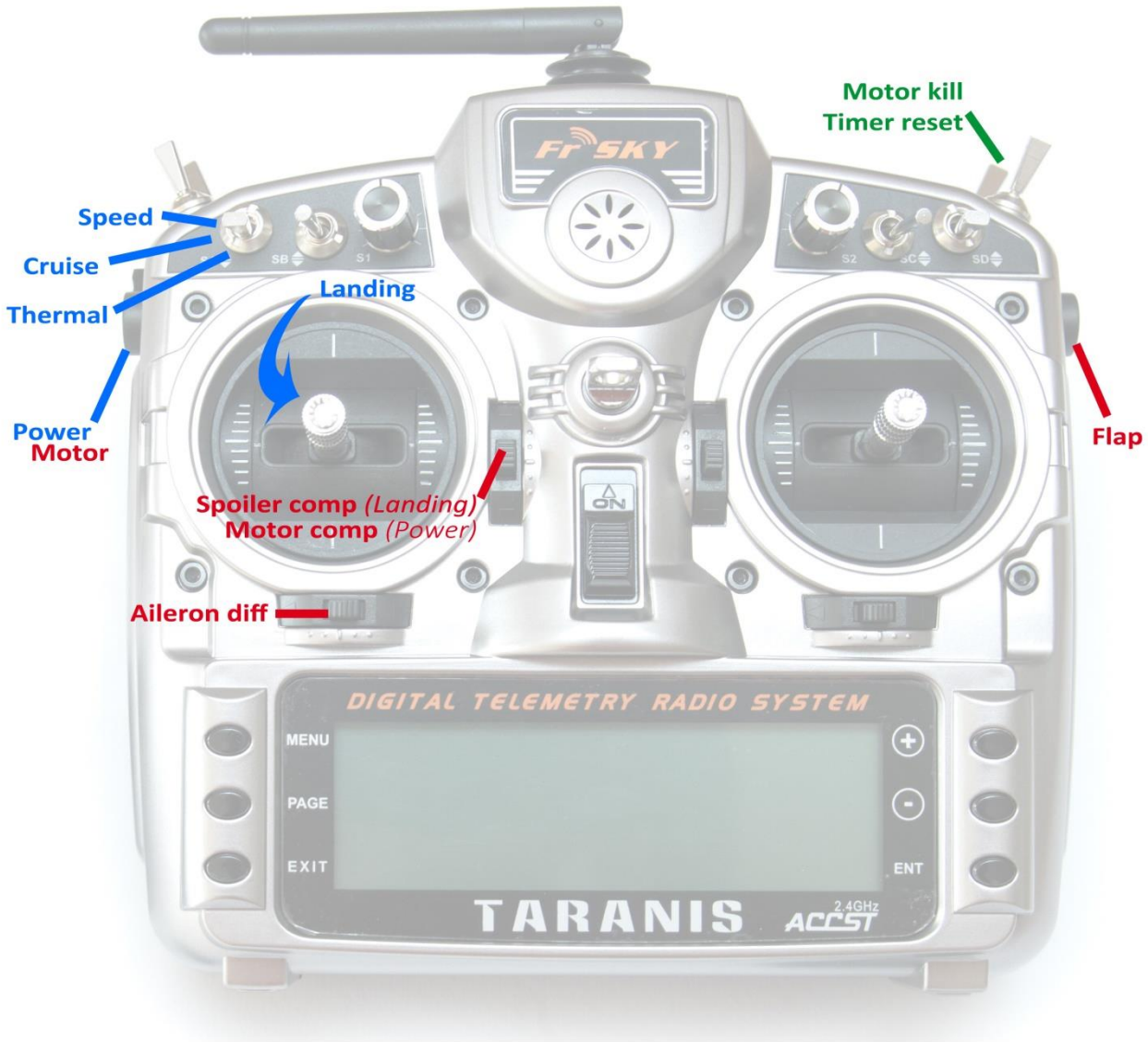

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1 Introduction

E-Soar Plus is a full-feature template for full-house electric-powered gliders. It contains all the mixing needed for F5J competition, yet is easy to configure and operate. Key mixers may be adjusted in flight. An integrated flight timer is included.

Special attention has been paid to motor safety with a simple and secure motor arming system.

Version 2.1 adds compatibility with OpenTx 2.2.

Please read through the instructions carefully before starting.
☠ Make sure the motor is disconnected during setup.

1.1 Package contents

Filename	Description
esoarplus_21_SetupGuide.pdf	Setup guide
esoarplus_21_SettingsRef.xls	Settings reference
esoarplus_21x.eepe	EEPROM images for V- and X/T- tail
esp***.wav	Sound files

1.2 Requirements

The following will be required:

- FrSky Taranis or Horus transmitter
- OpenTx 2.1 or later (see change log for recommended versions)
- OpenTx Companion software + USB cable.

Some familiarity with the OpenTx's menus and data entry will be useful.

1.3 Nomenclature

US and UK modellers seem to use slightly different terms, and this occasionally causes confusion. For my friends in the US, please note the term 'spoiler' means the same as 'crow'.

1.4 Flight modes

There are 5 flight modes: Power, Landing, Thermal, Cruise and Speed. In the event of a clash, Power has highest priority, then Landing, then Cruise/Thermal/Speed. Changes in flight mode are accompanied by a voice alert.

Flight Mode	OpenTx ID	Activated by	Priority
Power	**FM2**	**LS↑**	**High**
Landing	**FM3**	**Throttle stick ↓**	**Mid**
Speed	FM5	SA ↑	Low
Cruise	FM4	SA —	Low
Thermal	FM0	SA ↓	Low

A special CAL flight mode (FM1) is provided for calibrating the control surfaces.

1.5 Mixers

The table below shows which mixers are active in each flight mode. Mix adjusters are in brackets.

Flight mode	Ail→ Flap	Ail→ Rud	Motor	Motor Comp	Spoiler	Spoiler comp	Rev diff	Camber	Diff
Power	Y	Y	Y(**LS**)	Y(**Thr trm**)					Y(**RudTrm**)
Landing	Y	Y			Y	Y(**Thr trm**)	Y		Y(**RudTrm**)
Cruise	Y	Y							Y(**RudTrm**)
Thermal	Y	Y						Y (**RS**)	Y(**RudTrm**)
Speed	Y	Y						Y	Y(**RudTrm**)

1.6 Stick and switch assignments

Stick assignments (mode1-mode4) are set in **MODEL SETUP→STICK MODE**.
Functions are assigned as follows:

Control	Function
Throttle stick	Spoiler
Throttle trim	Spoiler compensation adjust (Landing mode) Motor compensation adjust (Power mode)
Rudder trim	Aileron diff adjust
SA	Flight mode selector
LS	Motor
RS	Flap adjust (Thermal mode)
SH	Cancel CAL mode Stop/Reset timer Kill motor

1.7 Channel assignments

Channel #	Function	
1	Right aileron	
2	Left aileron	
3	Right flap	
4	Left flap	
5	Elevator	RtVee
6	Rudder	LtVee
7	Motor	
8	[free]	
9	[free]	

2 Operational Overview

Flight trims

- Aileron trim is shared across all flight modes
- Elevator trim is independent for each flight mode
- Rudder and throttle trims are repurposed for other functions (see below)

Camber mixes

- Camber is adjustable in Thermal mode using slider **RS**.
- Reflex (fixed) may be specified for Speed mode.

Spoiler compensation (spoiler to elevator)

- Spoiler compensation is a variable mix which compensates for pitch changes as spoiler is deployed.
- The amount of compensation can be adjusted during flight, via the **Throttle trim**.
- Non-linear compensation may be specified via curve 'SpComp'.

Motor compensation (motor to elevator)

- Motor compensation is a variable mix which compensates for pitch changes as power is applied.
- The amount of compensation can be adjusted via the **Throttle trim**.

Differential

- Diff is applied to ailerons and flaps
- Diff is adjustable via the **Rudder trim**.
- Diff settings are stored per flight mode.

Roll rate enhancement

- Aileron diff reduces to zero as spoiler is deployed. This helps with roll response under crow.
- An adjustable 'Reverse diff' mix further improves roll response under braking.

Aileron to rudder ('combi')

- Aileron to rudder mix can be applied individually for each flight mode.

3 Motor operation

3.1 Arming the motor

The motor is disarmed by default. To arm the motor:

1. Move **LS↓**
2. Apply full right-aileron & full up-elevator, and hold
3. Pull SH and hold for 1 second until the startup sound
4. Release **SH**
5. Release stick(s)

A warning beep sounds every 12 seconds to indicate that the system is active.

3.2 Running the motor

Pushing forward on **LS↑** selects Power mode.

- If the system is armed, the motor will run.
- If the system is not armed, a "motor control disabled" alert sound. Power mode is still active even though the motor is not running.

Note: **LS** incorporates some deadband, to help prevent accidental operation of the motor.

3.3 Disarming the motor

To disarm the motor motor, pull **SH** for 1 second until you hear the 'motor control disabled' alert.

3.4 Motor safety

> ☠ **To minimise the risk window, arm the motor immediately before launch, and disarm straight after landing.**
>
> ☠ **The arming system will not protect against loss of signal. It's therefore imperative to set the failsafe on your transmitter, so the motor is commanded to 'off' on loss of signal.**

4 Flight Timer

Timer1 is configured as a semi-automatic flight timer. The timer is named 'Flight' and is visible from the main screen.

- To start, advance motor
- To stop, short pull (< 1 sec) on **SH**. The elapsed time will be called.
- To reset, disarm the motor (long pull on **SH**).

5 CAL mode

A special CAL flight mode is provided for calibrating the control surfaces. When CAL mode is active, all mixers and trims are disabled. To enable CAL mode:

1. Apply full left aileron and full up elevator, and hold
2. Pull **SH**
3. Release **SH**
4. Release stick(s)

When CAL mode is enabled, a beep sounds every 5 secs and a voice alert every 15 secs.
To exit CAL mode, pull **SH**.

New in v2: There are three CAL sub-modes selected via switch **SA**:

- **SA—**: calibrate end points and centres
- (*new in v2)* **SA↓**: calibrate flap neutral
- (*new in v2)* **SA↑**: calibrate ailerons using reduced throws

Note: **In** CAL **mode, the response of the throttle stick is stepped at 25% increments. This is to aid flap calibration.**

6 Setting up your transmitter

Transmitter configuration is in three phases:

- Preparation – copying files to the transmitter
- Servo calibration – setting servo end points and centres
- Mixer adjustment – setting control travels and mixers

Adjustments should be made in sequence shown. Use the tick boxes to record progress.

> ☠ **Ensure that the motor is disconnected before proceeding.**

6.1 Preparation

6.1.1 Transfer files to transmitter

In this step you'll upload the setup to your transmitter's EEPROM.

Establish communication with your PC

- □ ***Taranis:*** Switch on the transmitter whilst pressing horizontal trim levers towards the centre
  Horus: Switch on the transmitter
- □ Connect the tx to the computer via USB. The transmitter's SD card should appear as an external drive.

Copy sound files

- □ On your PC, extract all files from .ZIP package
- □ Copy the sound files to the /SOUNDS/{language} folder on the SD card. For example, English folder is "/SOUNDS/en".

Transfer model to transmitter

- □ Launch OpenTx Companion
- □ Open the esoarplus_xx.eepe file. Versions for X/T and V tails are displayed in a window.
- □ From the File menu, choose **READ MODELS AND SETTINGS FROM RADIO**. The transmitter's EEPROM contents are displayed in a second window.
- □ ***Taranis:*** Drag one of the ESOARP models into an empty slot in your EEPROM.
  Horus: Create a dummy model in your EEPROM; copy/paste an ESOARP model into the new model using Ctrl+C/Ctrl+V.
- □ Close the esoarplus_xx.eepe window.
- □ In the EEPROM window, right-click on new model and choose "Use as Default"
- □ From the File menu, choose **WRITE MODELS AND SETTINGS TO RADIO**.
- □ Close OpenTx Companion

6.1.2 Stick calibration

Important: Your sticks must be properly calibrated. Forgetting to calibrate is one of the main causes of problems, from jumping neutrals to flight modes which cannot be activated. Calibrate as follows:

- □ From the main screen press {long MENU}, then {PAGE} to Calibration menu.
- □ Remember to calibrate all sticks, knobs and sliders.

6.1.3 X9E & Horus remapping

If using an X9E or Horus transmitter, some controls must be remapped:

- □ Open the Mixers menu
- □ Change the source of CH18 to 'LS'
- □ Change the source of CH20 to 'RS'

Tip: If sources cannot be changed via the dropdown menu, try moving the controls directly.

6.1.4 Familiarisation

Using the transmitter on its own, familiarise with the setup. At the end of this step, you should be confident with the following:

- □ Arming and disarming the motor (with motor disconnected!)
- □ Selecting Thermal, Cruise, Power, Speed and Landing modes
- □ Entering CAL mode and submodes
- □ Start/stop/reset integrated flight timer

Verify that the sounds are working correctly. If not, check that the sound files are in the correct location.

6.2 Calibrating the servos

In this section you'll calibrate the servos. The goals are:

- Maximise control surface movements
- Achieve a left/right symmetry regardless of linkage differences
- Linearise responses.

All the adjustments in this section are made in CAL mode.

Note: correct calibration is essential for diff to work correctly, and for precise tracking of flaps with ailerons.

6.2.1 Prepare for calibration

- ☐ Switch on the transmitter (do not power up the receiver yet)
- ☐ Enter CAL mode, and set switch **SA** to middle.
- ☐ Power up the receiver
- ☐ Open the **OUTPUTS** menu

6.2.2 Set servo rotation

- ☐ Set the servo rotation according to table below. Pay attention to notes regarding aileron and elevator.

Stick command	Control surface	Notes
Aileron stick right →	RtAil goes up ↑ LtAil goes up↑	Ailerons **move together** in CAL mode
Thr stick forward ↑	RtFlap goes up↑ LtFlap goes up↑	Ignore any "invert throttle" message when reversing an output.
V-TAIL only: Ele stick forward ↑	RtVee goes up ↑ LtVee goes up ↑	In CAL mode, elevator(s) operate in **reverse to normal**. On exit from CAL mode operation will be correct.
X-TAIL only: Ele stick forward ↑	Ele goes up ↑	
X-TAIL only: Rudder stick right →	Rud goes right →	As normal

To change the direction of an output:

1. Skip to the Direction field
2. Press {ENTER}, and immediately {EXIT}

Finally, check operation as follows:

- ☐ Exit CAL
- ☐ Enter Cruise mode.
- ☐ Check for correct direction of aileron, elevator and rudder (note: the flaps cannot be checked yet).

6.2.3 Calibrate servo end-points and centres

In this section you'll use the **OUTPUTS** menu to adjust the end points and centres of the servos. When setting end-points, consider all inputs affecting the servo. For example, flap movement should be allow for crow and aileron inputs. Otherwise a servo may stop dead before the commanded position is reached, resulting in deadband at the stick (sometimes this will be unavoidable – or even desirable!).

If you don't know the movements required for your model, then set servo end-points to maximum subject to restrictions below.

New in version 2: calibration uses curves. **Leave min/max/subtrim at -150/150/0.**

Channel	Calibration procedure
☐ CH 4 – Lt Flap	Start by calibrating left flap (CH4). The goal is (a) set the end points, and (b) linearise the response. *Note:* the flap neutral will be adjusted later. 1. Enter CAL mode 2. Set switch **SA** to middle position 3. In the **OUTPUTS** menu, highlight CH4 4. Skip to curve field CV14, and press {long ENTER} to open curve editor 5. Throttle stick fully back (↓), adjust point 1 for lower end point. Allow for both crow and aileron inputs. 6. Throttle stick fully forward (↑), adjust point 3 for upper end point. Allow for any aileron-to-flap mixing. 7. Adjust point 2 so it lies on the straight line thru points 1 and 3. 8. Move throttle stick from one end to the other, observing step intervals. You can fine tune point 2 to equalise intervals for best linearity.
☐ CH 3 – Rt Flap	Next, calibrate the right flap (CH3). The goal is to precisely match the left flap. 1. Enter CAL mode 2. Set switch **SA** to middle position 3. In the **OUTPUTS** menu, highlight CH3 4. Skip to curve field CV13, press {long ENTER} to open curve editor Adjust points 1 – 5 to exactly match the left flap: 5. stick fully back, adjust point 1 6. stick ½-back, adjust point 2 7. stick to centre, adjust point 3 8. stick to ½-forward, adjust point 4 9. stick fully forward, adjust point 5 To match the end points on left and right sides, it may be necessary to reduce one or other end points for the left flap.
☐ Flap neutral	Next, set the flap neutral: 1. Enter CAL mode 2. Set switch **SA** to down position. An adjustable offset is applied to each flap. 3. Open the **GLOBAL VARIABLES** menu. 4. Highlight GV4('FlNeut') and skip to the FM0 column. 5. Adjust GV4 for correct neutral. Check that the flaps are perfectly in line at the neutral position. If not, then check calibration of the right flap (see previous step), paying particular attention to the 2 points either side of the the neutral position.
V-Tail ☐ CH 5 – RtVee ☐ CH 6 – LtVee	Calibrate V-tail surfaces: 1. Enter CAL mode 2. In the **OUTPUTS** menu, highlight CH5 3. Skip to curve field 'CV15', press {long ENTER} to open curve editor 4. Ele stick to centre, adjust point 2 for correct neutral 5. Ele stick forward (↑), set point 3 to upper limit 6. Ele stick back (↓), set point 1 to lower limit. Allow for spoiler comp. 7. Repeat for CH6/CV16, ensuring that movements match CH5. 8. Check equal travel up/down; left and right surfaces match

Channel	Calibration procedure
X-Tail ☐ CH 5 – Ele	*X-tail version only* - Calibrate elevator 1. Enter CAL mode 2. In the **OUTPUTS** menu, highlight CH5 3. Skip to curve field 'CV15', press {long ENTER} to open curve editor 4. Ele stick to centre, adjust point 2 for correct neutral 5. Ele stick forward (↑), adjust point 3 to upper limit 6. Ele stick back (↓), adjust point 1 for to lower limit 7. Check travel is equal up & down
X-Tail ☐ CH 6 – Rudder	*X- tail version only* - Calibrate rudder 1. Enter CAL mode 2. In the **OUTPUTS** menu, highlight CH6 3. Skip to curve field 'CV16', press {long ENTER} to open curve editor 4. Rudder stick to centre, adjust point 2 for centred rudder 5. Rudder right (→), set point 3 for max right movement 6. Rudder left (←), set point 1 for max left movement 7. Check equal travel left/right

☐ CH 1 – Rt Ail
☐ CH 2 – Lt Ail
	Finally, calibrate ailerons:
	1. Enter CAL mode
	2. Set switch **SA** to down position. The flaps will go to their calibrated neutrals.
	3. In the **OUTPUTS** menu, highlight CH1(RtAil)
	4. Skip to curve field CV11, then press {long ENTER} to open curve editor
	5. Move aileron stick to centre. Set Point 2 for correct centre.
	6. Move aileron stick right (→). Set point 3 to desired upper limit, allowing for both crow and aileron movement.
	7. Move aileron stick left (←). Adjust point 1 so that down-travel = up-travel. If you can't get enough down movement due to geometry, then
	  1. Move **SA** up (↑) – this reduces aileron movement by 50%. *Note:* this reduced rate applies *only in CAL mode*!
	  2. Now try again: Move aileron stick left (←) and adjust point 1 so down-travel = (reduced) up-travel. Full rate will be restored when you exit CAL; don't worry if down-travel is excessive – later adjustments to input and diff will reduce it.
	8. Repeat all steps for CH2/CV12. Ensure that movements match CH1.
	9. Check: (a) same up/down rate per aileron, and (b) left and right ailerons match.

☐ Exit CAL.

☐ Move the sticks, checking that aileron, elevator and rudder control surfaces move in the correct direction. *Note:* flaps cannot be checked yet.

Well done, the calibration is now complete!

6.2.4 Backup your EEPROM

This is a good time to back up your EEPROM.

☐ Exit to the main Info screen

☐ Press {long MENU}, then {PAGE} till the Version menu appears, then press {long ENTER}.

There may be a short delay while the EEPROM is written.

7 Configuring inputs and mixing

In this last section, you'll set the control movements and mixing.

Control / mix	Adjustment point	Adjustment procedure
□ Aileron rate	INPUTS→Ail	Set the default rate for ailerons. 1. Open the Inputs menu 2. Scroll down to [I]Ail 3. Press {long ENTER} and choose Edit 4. Skip to the weight field 5. Enter Cruise mode 6. Adjust weight for required *up*-aileron movement (down movement is affected by diff setting to be adjusted later) 7. If Expo is required, skip to Curve field, choose 'Expo' as the curve type, and set required value in adjacent field. *Note:* The curve ('Expo', 'Diff' etc.) is applied at the stick level. ***Do not set a value using the Diff curve type*** as it will result in asymmetric stick response If particular flight modes require non-default rates or expo, then insert additional input(s) ***before the CATCHALL line****.* Each new input should have one or more flight mode numbers enabled, and appropriate weight and expo. Flight mode numbers as follows: 0: Thermal 2: Power 3: Landing 4: Cruise 5: Speed ***Safety note: The 'CATCHALL' line must have all flight modes enabled, no switch and –Important - it must be the last (or the only) line.***
□ Elevator rate	INPUTS→Ele	As above
□ Rudder rate	INPUTS→Rud	As above
□ Aileron→Flap	GVARS→GV5('A2F')	Aileron to flap mixing is set per flight mode. 1. Open **GLOBALVARS** menu, skip to GV5 line ('A2F'). 2. Activate the flight mode you want to adjust. 3. Skip to highlighted column. 4. Adjust value as required. *Note:* the movement of down-going flap will be affected by diff setting.
□ Ail→Rudder	GVARS→GV7('A2R')	This mix can help smooth turns without the need to coordinate rudder and aileron controls. Adjust per flight mode as follows: 1. Open **GLOBALVARS** menu, skip to GV7 line ('A2R') 2. Activate the flight mode you want to adjust. 3. Skip to highlighted column. 4. Adjust value as required
□ Spoiler→Ail	GVARS→GV1('CmAil')	Sets the upward aileron movement due to spoiler. 1. Enable Landing mode 2. Open **GLOBALVARS** menu 3. Skip to cell GV1/FM3 4. Move throttle stick back (full spoiler) 5. Adjust value for required up-aileron movement

Control / mix	Adjustment point	Adjustment procedure
□ Spoiler→Flap	GVARS→GV2('CmFlap')	Sets the downward flap movement due to spoiler. 1. Enable Landing mode 2. Open **GLOBALVARS** menu 3. Skip to cell GV2/FM3 4. Move throttle stick back (full spoiler) 5. Adjust value for required down-flap movement
□ Camber→Ail □ Camber→Flap	GVARS→GV1('CmAil') GVARS→GV2('CmFlap')	Camber can be adjusted in Thermal mode using lever **RS**. Adjustment range = +/- 50%. For example if nominal camber is 4 degrees (**RS** at centre), the range will be from 2 to 6 degrees (**RS** at end points). In this step, you will set nominal camber. Start with flaps: 1. Enable Thermal mode 2. Move **RS** to centre position. 3. Open **GLOBALVARS** menu 4. Adjust GV2/FM0 as required 5. For ailerons, repeat 2-4 above using GV1/FM0. 6. Check by moving **RS** forward and back.
□ Reflex→Ail □ Reflex→Flap	GVARS→GV1("CmAil") GVARS→GV2("CmFlap")	Reflex can be preset in Speed (FM5). Start with flaps: 1. Enable Speed mode 2. Open **GLOBALVARS** menu 3. Adjust reflex in GV2/FM5 4. Repeat for ailerons using GV1/FM5
□ Reverse diff	GVARS→GV6('RvD')	Reverse diff can improve roll response under braking, by increasing movement of down-going aileron. 1. Enable Landing mode 2. Open **GLOBALVARS** menu, highlight GV6/FM3 3. Apply full spoiler and full aileron 4. Adjust GV6/FM3 so that the down-going aileron is at the desired position (normally a little below the neutral position) *Note:* this measure for improving roll response is in addition to aileron diff suppression, which is automatically applied.
□ Motor→Ele compensation	GVARS→GV3('Cmp')	Motor compensation is used to counteract pitch changes due to motor thrust. It is adjustable in flight via the **thr trim**: • Trim forward → pitch down • Trim centre → zero compensation • Trim back → pitch up Initial setting should be with motor disarmed. 1. Open **GLOBALVARS** menu, highlight GV3/FM2 2. Enable Power mode (with motor control disabled) 3. Push **LS** fully forward (max motor). 4. Move throttle trim fully forward (max down comp) 5. Adjust GV for required max down compensation 6. Move throttle trim to centre prior to flight tests During test flights: 1. Enter Power mode. 2. Apply minimum power (while still in Power mode), and adjust ***elevator* trim** for level flight. 3. Apply full power and adjust ***throttle* trim** for level flight.

Control / mix	Adjustment point	Adjustment procedure
□ Spoiler→Ele compensation	GVARS→GV3('Cmp')	Spoiler compensation is used to counteract pitch changes due to spoiler/crow. It is adjustable in flight using the **throttle trim**. • Trim fully back = zero compensation • Trim forward = down compensation Set the range of compensation adjustment: 1. Enable Landing mode. 2. Open **GLOBALVARS** menu, highlight GV3/FM3 3. Apply maximum spoiler 4. Move **throttle trim** fully forward (max downwards comp) 5. Adjust GV3 for max down compensation. 6. Move **throttle trim** to nominal setting for flight. If not known, set trim to full back (zero compensation). During flight tests 1. Enter landing mode 2. Apply *minimum* spoiler while still in Landing mode. Adjust ***elevator* trim** for required glide angle. 3. Apply *full* spoiler. Adjust ***throttle* trim** for required glide angle. 4. Apply 1/3 and 2/3 spoiler. If response is non-linear, adjust response via curve 'SpComp' (alter intermediate points only).

Congratulations, you've finished setting up your model! Just one last thing….

□ Back up your EEPROM now!

8 Verify motor channel

One final safety check.

□ With the motor disconnected, Enter **CHANNEL MONITOR** menu:

- Taranis: Opening screen, then press {PAGE}x3
- Horus: Opening screen, press {MDL}x2

□ Check for correct behaviour of the motor channel (CH7). Practice arming, disarming and applying throttle, while monitoring Channel 07. Motor-off = -100, full power = +100.

9 Summary of in-flight adjusters

Target	Adjuster	Flight mode	Notes
Aileron Diff	**Rudder trim**	[Any]	Diff is stored per flight mode Default range is 0 - 70% Trim centre corresponds to 35% diff
Spoiler→Ele compensation	**Throttle trim**	Landing	Adjust compensation with full spoiler deployed Trim fully back → zero comp
Motor→Ele compensation	**Throttle trim**	Power	Adjust compensation with motor at full power Trim in centre → zero comp
Aileron Trim	**Aileron trim**	[All]	Aileron trim can be adjusted in any flight mode but is global, i.e. the same trim value is shared by all flight modes.
Elevator trim	**Elevator trim**	[Any]	Elevator trim is stored per flight mode

10 Customisations

This section describes various simple customisations you can make. Apply after the basic setup is complete and backed up. Customisations will not affect mixer adjustments, so you customise at any time without breaking the setup.

10.1 Changing the assignments of Spoiler, Motor and Flap

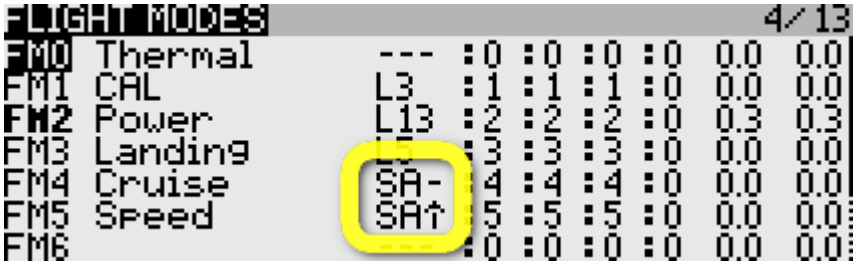
Spoiler, motor and flap functions may be assigned to any suitable control. Recommended options for the Taranis X9D are as follows:

Function	Assign to	Default	Menu point
Spoiler	**Thr**, **LS**, or **RS**	**Thr**	Mixers→CH17
Motor	**Thr**, **LS**, **RS**, or 3p switch	**LS**	Mixers→CH18
Flap	**Thr**, **LS**, **RS**, or 3p switch	**RS**	Mixers→CH20

10.2 Changing the flight mode switch

By default, the main flight mode switch is **SA**. You can specify another switch Sw instead, as follows:

1. Choose Sw from any 3-position switch (for X9D these are **SA**, **SB**, **SC**, **SD**, **SE** or **SG**).
2. In the **FLIGHT MODES** menu, set the switches as follows:
   - FM4 (Cruise): **Sw—**
   - FM5 (Speed): **Sw↑**

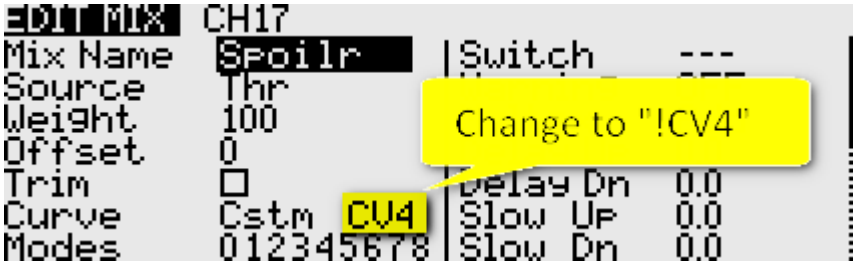


Note: **Sw↓** will select Thermal mode (you don't set this explicitly).

10.3 Reversing the spoiler stick

By default, zero spoiler corresponds to throttle stick fully-forward. To reverse the behaviour:

1. Open the Mixers menu
2. Skip down to CH17 (RawSpl)→Spoilr
3. Open the mixer editor
4. Change the curve from 'CV4' to '!CV4' (note leading exclamation mark).



10.4 Reversing motor lever

By default, motor off (idle) corresponds to **LS** fully back. To alter so that motor off is with **LS** fully forward:

1. Open the Mixers menu
2. Skip down to CH18 ('RawMot')
3. Open the mixer editor
4. Change weight from +100 to -100

Note: this alters the direction of the motor lever only. The idle and full power commands sent to the motor are unchanged.

10.5 Reversing flap lever

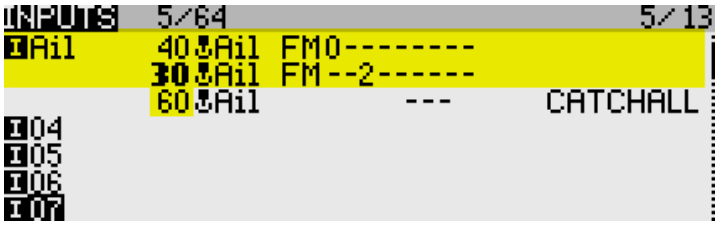
To reverse the direction of the flap laver

1. Open the **MIXERS** menu
2. Skip to CH 20 ('Flap')
3. Change weight from +25 to -25

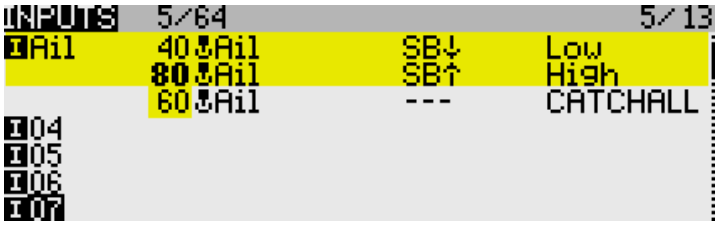
10.6 Rates

There is no dedicated 'rates' or 'expo' menu in OpenTx. Instead, you add extra lines in the **INPUTS** menu**.** Here are examples showing triple rates (a) linked to flight-modes and (b) selected by switch:

(a) Aileron rate by flightmode: Thermal (FM0) 40%; Power mode (FM2) 30%; all other flight modes: 60%



(b) Aileron rate by switch: SB↓ 40%; SB↑80%; default (SB—): 60%



***How OpenTx handles inputs*:** Starting with the first line, OpenTx reads the fm and switch values, and compares them with the current state. If a match is found, OpenTx uses those rate/expo values. If there is no match, OpenTx advances to the next line and repeats the test. And so on till either a match is found or the end of the list is reached.
Note 1: **If no match is found, the control will be inoperative**. As a defence against this possibility, the last line should be a 'CATCHALL' with **all flightmodes and no switch**.
Note 2: If both flightmode and switch are specified in the same line, both must match for the line to be active.

10.7 Altering minimum SH duration for motor arm/kill

In order to arm or kill the motor, **SH** must be pulled for a certain minimum duration.
To increase or decrease the minimum duration:

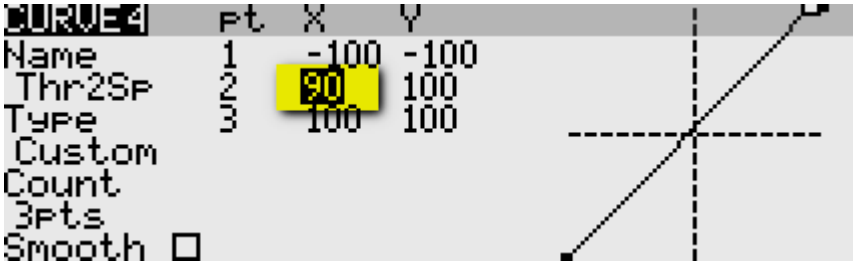
1. Open the **LOGICAL SWITCHES** menu
2. To alter arming duration, edit L8. Default = 1.2 secs
3. To alter the kill duration, edit L11. Default = 1.1 secs

Note: For reliable operation, the kill duration must be less than the arming duration.

10.8 Adjusting spoiler stick deadband

The spoiler stick response incorporates some deadband at the idle end to help prevent accidental deployment. The default value should be fine for most pilots; however it can be adjusted as follows:

1. Go to Curves menu
2. Open Curve 4 ('Thr2Sp')
3. Adjust pt2 -> X. Decrease value to increase the deadband. Default value is 90.



11 Pre-flight checks

Before using this setup for the first time, remember to:

- Train your ESC to recognise the motor off/on commands – consult your ESC documentation.
- Set the battery alarm threshold to suit your battery chemistry, for both the tx and rx.
- Set the failsafe so that the motor channel CH7 is set to off (-100) on loss of signal.

12 Applying your own modifications

If you wish to make your own modifications, please study the Excel documentation carefully and make sure you understand the implications of any changes. Recommended workflow as follows:

1. Setup your model first, as described in this manual
2. Backup your work
3. Apply your modifications incrementally, testing and backing up as you go along.

13 Disclaimer

Although this setup is tested, it's up to the pilot to make sure that the controls respond correctly under all conditions. The author will not be responsible for the consequences of any bugs in the setup or documentation or as the result of changes in OpenTx.

Remember to test your setup thoroughly before the first flight and after any modifications!

If in doubt, don't fly!!

14 Contact

If you have any queries or suggestions, or if you find any errors in the documentation, or just want to say hello, then please contact me at http://rc-soar.com/email.htm.

Safe flying!
Mike Shellim